(12) UK Patent Application (19) GB (11) 2 147 673 A

(43) Application published 15 May 1985

(21) Application No 8424601

(22) Date of filing 28 Sep 1984

(30) Priority data

(31) 3336302 (32) 6 Oct 1983 (33) DE

(51) INT CL⁴
F16D 55/224

(52) Domestic classification
F2E 2N1C2C 2N1C3 2N1D16 EI EL
F2S 609B CB
U1S 2013 F2E F2S

(56) Documents cited
GB A 2046855
GB A 2043187
GB 1577856
GB 1576503
GB 1279055

(58) Field of search
F2E

(71) Applicant
Alfred Teves GmbH (FR Germany),
7 Guerickestrasse, 6000 Frankfurt am Main, Federal Republic of Germany

(72) Inventors
Rolf Weiler,
Uwe Bach,
Penter Panek

(74) Agent and/or Address for Service
J.C. Vaufrouard,
ITT Patent Department UK, Maidstone Road, Foots Cray, Sidcup DA14 5HT

(54) Floating caliper spot-type disc brake

(57) Brake caliper (10) is axially guided at pins screwed to a brake carrier (1) and is arranged between carrier elements (5, 6) of the brake carrier (1); an integral wire spring (17) biases the brake caliper and back plate (2) of brake shoe (13) in direction A. The spring is fastened to the back plate with the spring stem ends (3, 4) which form a radial arm (e), two resilient arms (b, c) being provided which extend from the radial arm (e) in diametrically opposite directions and parallel to the plane of the back plate. The free ends (36, 37) are abutted against the brake caliper to urge the latter in the longitidinal direction of a piston. Stems (31, 32) form a parallel spring (d) and are bent in their end portion 28 so that portion 28 forms a sliding element abutting with the bottom side of the carrier element (b) as in Figure 1 or with inner face of the carrier element as in Figure 4.

The spring (17) is coupled to back plate (2) by means of a grooved pin (24) with washer (25) with ends (3, 4) abutting ribs (26, 27) of the back plate (2) to prevent spring (17) turning about pin (24).

Fig. 1

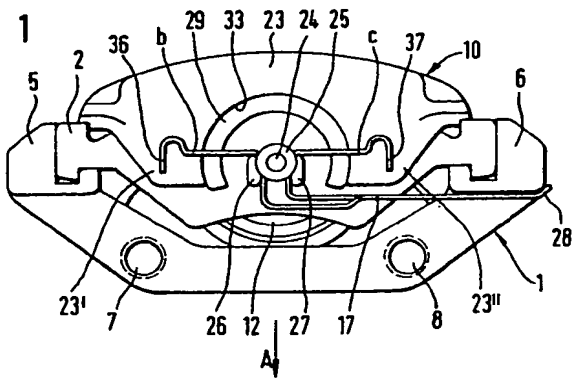
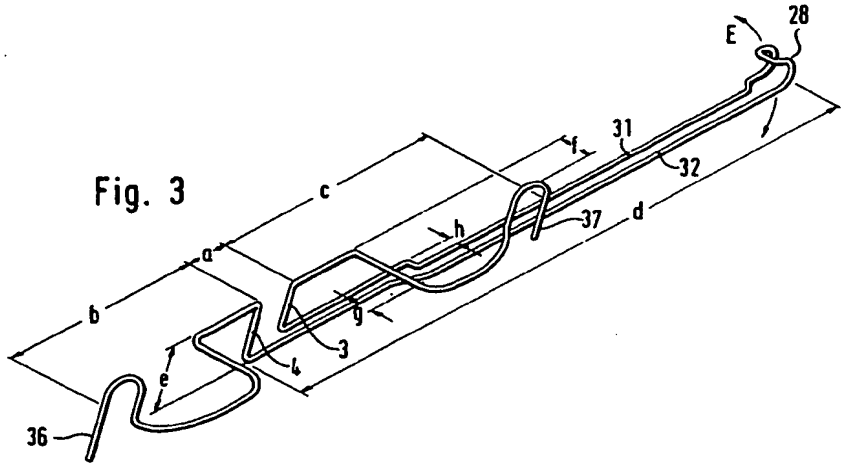


Fig. 3



GB 2 147 673 A

2147673

Fig. 1

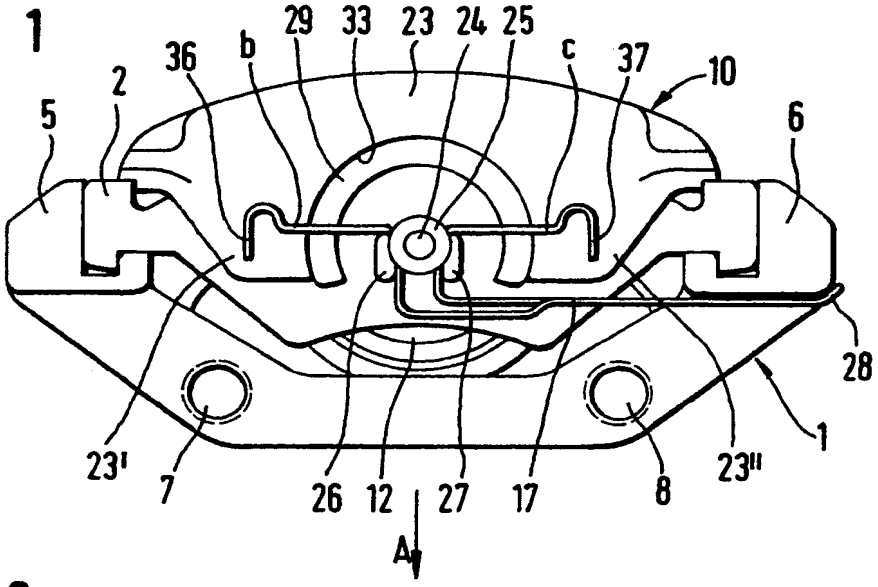


Fig. 2

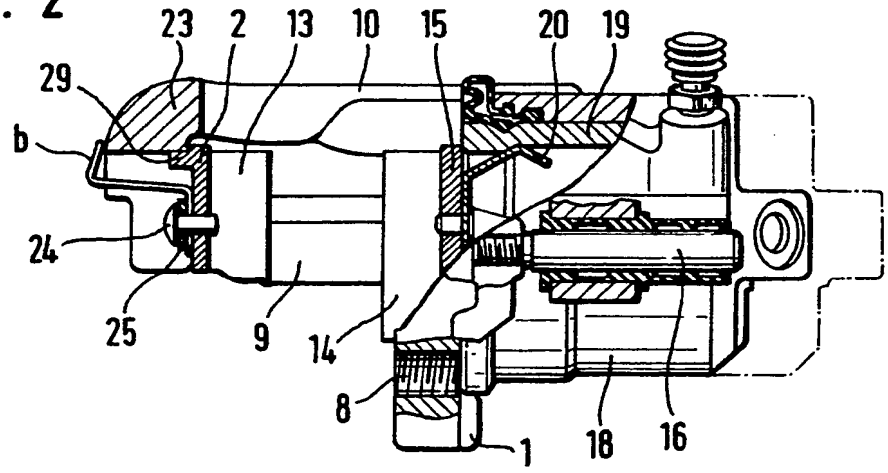
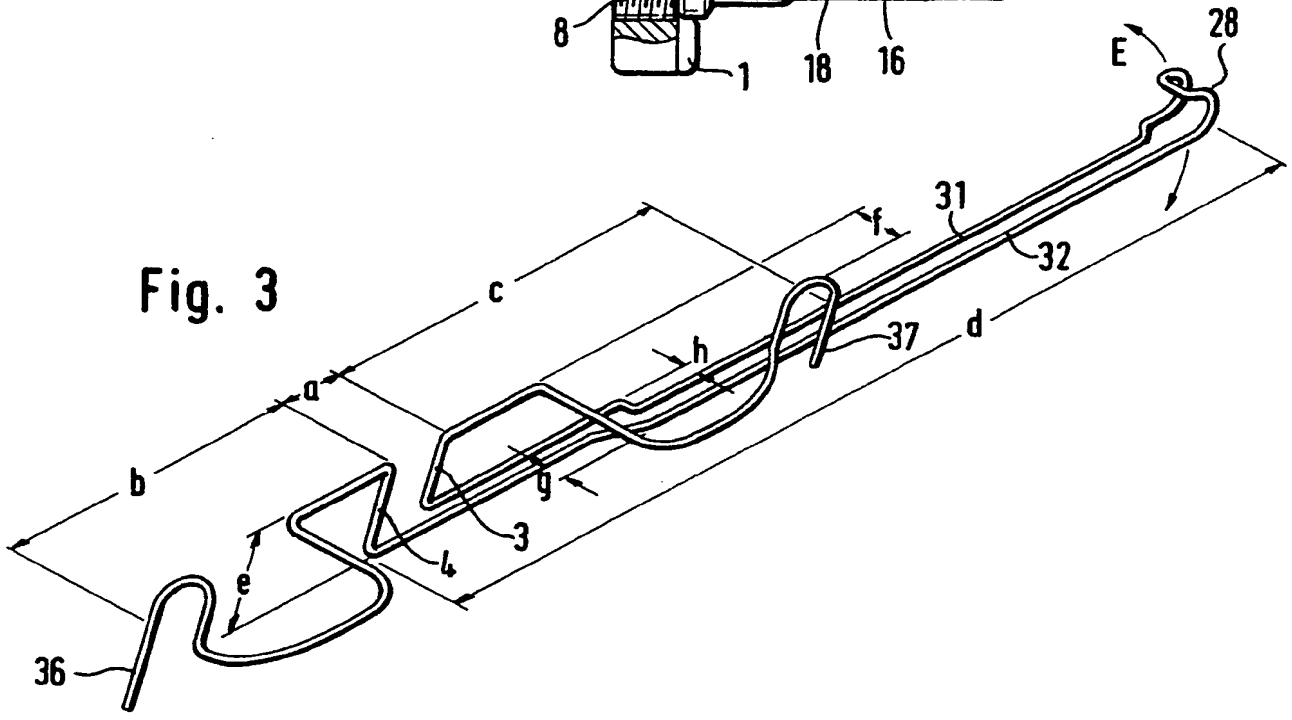


Fig. 3



2147673

Fig. 4

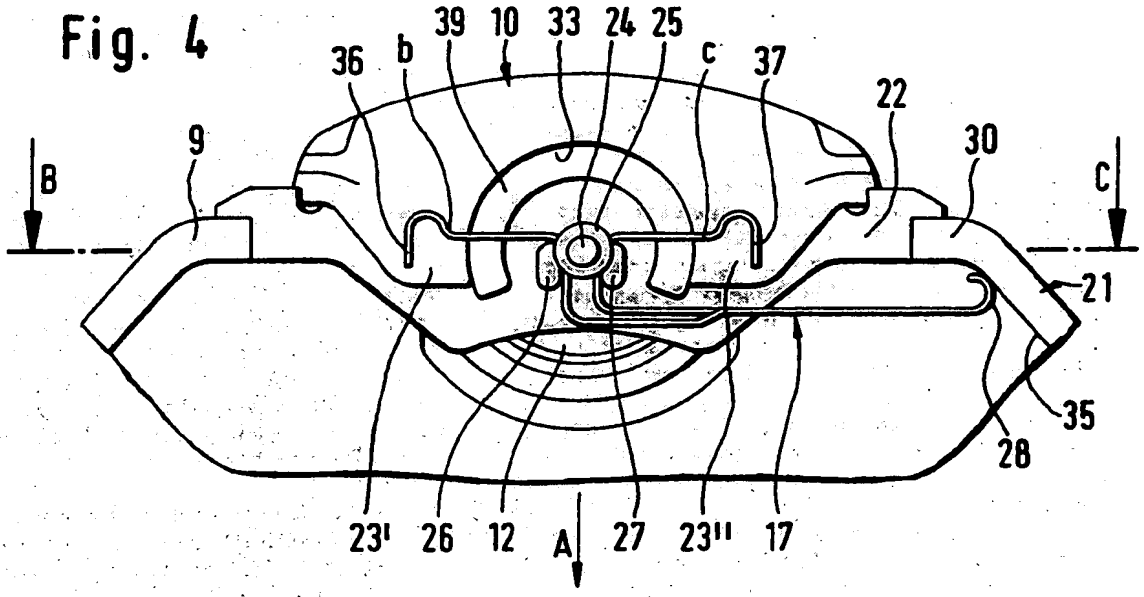


Fig. 5

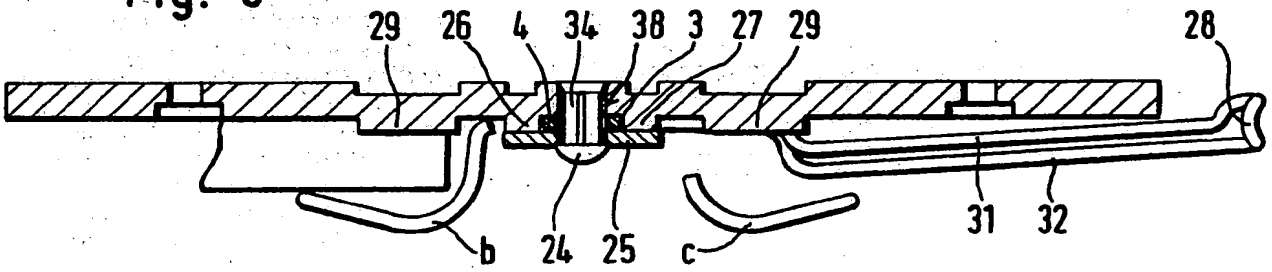


Fig. 6

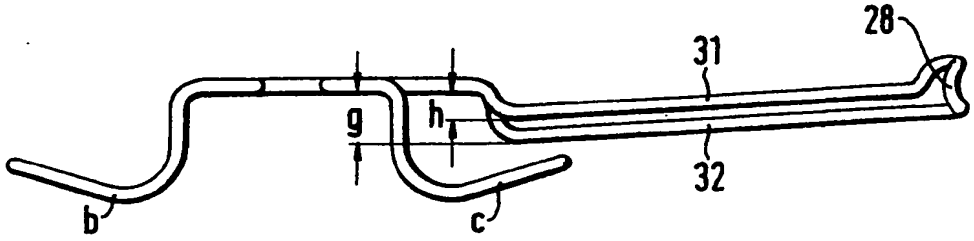
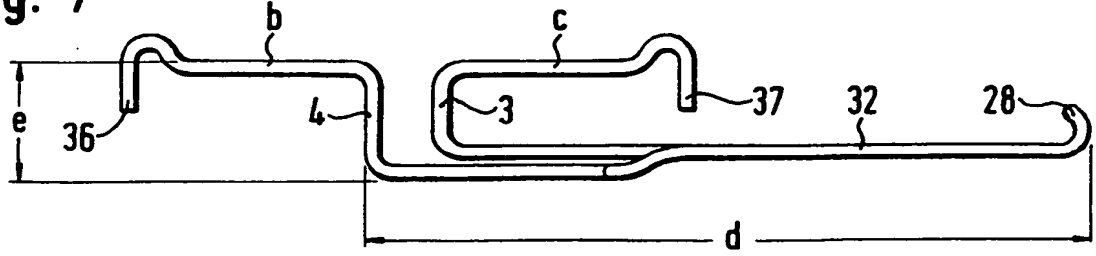


Fig. 7



SPECIFICATION

Floating caliper spot-type disc brake

This invention relates to a floating caliper spot-type disc brake, in particular for an automotive vehicle, of the kind having a brake caliper axially slidably guided at a brake carrier and arranged between carrier elements of the brake carrier together with a spring biasing the brake caliper and the brake carrier radially against each other and being supported with at least one spring arm at the front end of the brake caliper facing away from the actuating device.

In floating caliper spot-type disc brakes, springs are necessary for mutual biasing of the brake caliper and brake carrier in order to keep the guides of the brake caliper free from play so as to prevent rattling of the brake caliper in its guides in the event of vibrating movements, for example when driving on a bumpy roadway.

In a known floating caliper spot-type disc brake of the kind referred to (French Patent Specification 1,348,468), the brake caliper rests on the carrier plates of the brake shoes arranged on either side of the brake disc which are guided, on their part, at the carrier elements of the brake carrier which straddle the brake disc.

The brake caliper is retained in its position by a leaf spring straddling the radially external edge of the brake caliper and whose ends are detachably fastened to the arms of the brake carrier. A disadvantage of this known floating caliper spot-type disc brake consists in that the leaf spring is located at one point, precisely between the outer edge of the brake disc and the inner edge of the vehicle wheel, since the overall constructional space available for the brake caliper is as a rule very small. It is a further disadvantage of this known brake that the brake caliper shifts relative to the leaf spring as the wear of the brake shoes proceeds, so that the position of the centre of gravity of the caliper relative to the plane of action of the leaf spring becomes increasingly unfavourable. The leaf spring must, therefore, have a higher preload from the beginning in order to balance that disadvantage.

Furthermore, a floating caliper spot-type disc brake (German printed and published patent application 2,840,374) is known in which the spring is fastened with a centre portion to the front end of the brake caliper facing away from the actuating device and is provided with two spring arms extending substantially parallel to the brake disc and being slidably abutted against the carried elements of the brake carrier, the spring being detachably hooked to the brake caliper and secured against spontaneous loosening by its own spring tension. The spring which is stamped from one sheet or plate metal blank is constituted by a spring leaf forming the spring arms. The centre portion of the leaf is furnished with a stem bent off vertically and having a substantially rectangular shape, at the free angles of which stem, hooks are die-formed for fixing the spring to the brake caliper.

A disadvantage of this known spring arrangement consists in that a brake caliper ready-assembled by the manufacturer of the brake cannot be mounted in the vehicle straightaway in a ready-assembled condition if the brake carrier constitutes an integral part of the steering knuckle and of the wheel suspension. A further disadvantage resides in the comparatively high costs which have to be faced for the two-armed spring formed from one sheet or a plate metal blank and finally also in the tendency of that spring to jump out of its catch at the brake caliper, particularly in the course of the mounting procedure.

The present invention has for its object to create a floating caliper spot-type disc brake of the kind referred to which simplifies the mounting of the spot-type disc brake, which is particularly inexpensive to manufacture and in which it is safeguarded that the spring biasing the brake caliper and brake carrier radially against each other does not unintentionally slide out of its retaining means at the back plate.

According to the invention in its broadest aspect, a floating caliper disc brake of the kind referred to is characterised in that the spring is provided with a stem extending roughly tangentially relative to the brake disc and parallel to the back plate and having a free end portion which is resiliently abutted against one of the two carrier elements of the brake carrier, the spring being furnished with at least one arm which is solidly coupled with the back plate.

Expediently, the spring is formed from one integral wire section and has an approximately τ-shaped configuration, the lower end of the radially extending arm of the spring which faces the axis of the brake disc being furnished with a stem supported at the carrier element and extending parallel to the two arms which are coupled to the upper end of the radial arm and supported at the brake caliper, and having such a length that it projects beyond the free end of the one resilient arm.

In a preferred embodiment, the τ-shaped spring is formed from a wire section whose free ends constitute two resilient arms approximately equal in length which extend from an intermediate portion of the wire section in diametrically opposite directions parallel to the plane of the back plate, with the intermediate portion, on its part, bent together in a U-shaped configuration so forming a parallel spring, and the two ends of the stems of the intermediate portion which are directed parallel to each other extending for a short length at right angles to the two resilient arms, in the direction of the axis of the brake disc, and that portion of the spring which comprises the end of the parallel spring being bent together in a U-shaped configuration extending tangentially relative to the brake disc and parallel to the back plate up to one carrier element of the brake carrier and being resiliently abutted against the latter with its end portion.

In order to ensure an untwistable and unslidable seating of the spring at the back plate, the latter is preferably furnished with ribs or cams against which the stem ends of the spring which form the radial arm are abutted, the length of the cams being such that the resilient arms extending in diametrically opposite directions are each applied on the pertaining cam in a straddling configuration at the upper

and lower end of that cam. To ensure that the back plate and spring form an integral part, it is preferably arranged that, in the range between the two cams of the back plate bearing the spring, there is provided a rivet, grooved pin or similar means which presses the stem ends of the spring to the lateral face of the back plate and which is firmly anchored to the back plate and furnished with a broad head portion straddling the stem ends.

Preferably, the back plate bearing the spring has a circular ring sector-shaped rib with which the back plate is abutted against a correspondingly shaped recess of the brake caliper, the recess being so dimensioned as to largely straddle the rib and to exclude in this manner any shift whatsoever of the back plate relative to the brake caliper in a radial direction.

The back plate may also have cams with which it engages corresponding depressions provided in the brake caliper, thereby excluding any twisting of the back plate relative to the brake caliper.

In order to make sure that the back plate is uniformly abutted against the brake caliper, the two resilient spring arms of the spring abutting against the brake caliper are bent out roughtly Ω-shaped in a plane at right angles to the plane of the brake disc, each of the external ends of the arms which are abutted against the brake caliper projecting a slight amount relative to the stem ends pressed to the back plate. Expediently, the two spring stems supported at the carrier element and bent together to form a parallel spring are of different lengths, the difference in length corresponding to the diameter of the shank of the grooved pin. Finally, the free end of the parallel spring formed by the two stems may be bent into the form of a hook and constitute a sliding element, the end portion of the spring being abutted against the inner face of the carrier element.

It is a particular advantage offered by the spring according to the present invention that not only may the spring be manufactured with very little expense but also its mounting on the back plate can be carried out with special ease by means of a rivet or grooved pin, since the cams which are provided at the back plate determine the correct position of the spring relative to the back plate so excluding any canting of the spring relative to the back plate during mounting. Special devices and mounting aids are not required, so that in case of an exchange of the spring, merely the grooved pin has to be beaten in upon having applied the new spring.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a view of that side of a floating caliper spot-type disc brake which faces away from the actuating device;

Figure 2 is a lateral view, partly in cross-section, of the floating caliper spot-type disc brake shown in Figure 1.

Figure 3 is a specific view of a spring according to the present invention in an enlarged representation;

Figure 4 is the view of that side of a floating caliper spot-type disc brake facing away from the actuating device, in which brake the brake carrier constitutes an integral part of the steering knuckle of the wheel suspension;

Figure 5 is a longitudinal section along the line B-C through the back plate of the spot-type disc brake shown in Figure 4;

Figure 6 is the top plan view of a separate spring as partly illustrated in Figure 5; and

Figure 7 is the front view of the spring shown in Figure 6.

The floating caliper spot-type disc brake illustrated in Figures 1 and 2 consists of a brake carrier 1 which extends substantially parallel to the brake disc (not illustrated in detail in the drawing) and is securable to a wheel carrier element or steering knuckle of a vehicle by means of bolts which can be screwed into the threaded holes 7, 8. The brake carrier 1 comprises carrier elements 5, 6 which straddle the edge of the brake disc. The carrier elements 5, 6 are each provided with a guide groove engaged by the ends of the back plates 2, 15 of the brake shoes 13, 14 which are arranged on either side of the brake disc. A brake caliper 10 positioned between the carrier elements 5, 6 of the brake carrier 1 and straddling the two brake shoes 13, 14 and the edge of the brake disc radially from the outside serves to actuate the brake shoes 13, 14. The brake caliper 10 is guided axially slidably at two pins 16 which are firmly screwed to the brake carrier 1 and extends at a distance beyond the lateral ends of the back plate 2. The pins 16 are arranged on both sides of the brake cylinder 18 forming one limb of the brake caliper 10 and extend parallel to the cylinder axis. A brake piston 19 being detachably coupled in snap fastener - fashion to the back plate 2 by means of a claw spring 20 fastened to the reverse of the carrier plate 15 serves to actuate the brake. The back plate 2 of the brake shoe 13 is directly abutted against the limb 23 of the brake caliper 10.

On actuation of the brake, the brake shoe 14 is urged to the left as seen in the illustration in Figure 2 by the action of the brake piston 19 until it is applied against the friction surface of the brake disc on having exceeded the brake clearance. Thereupon, the reaction force acting on the brake cylinder 18 urges the brake caliper 10 to the right, whereby the brake shoe 13, too, will come to be applied against the brake disc. As the brake linings become worn at the brake shoes, the brake caliper 10 will progressively shift more and more to the right, whereas the brake piston 19 will travel out of the bore of the brake cylinder 18. The maximum shift of the brake caliper admissible for the illustrated brake is marked by a dash-dotted line.

For the purpose of pressing the brake caliper 10 and, consequently, the carrier plate 2 of the brake shoe 13 against the guide faces at the carrier elements 5, 6 of the brake carrier 1 with sufficient force so as to exclude that the resilient movement of the steering knuckle or wheel carrier element may lead the brake caliper 10 to be lifted off from its guide faces, there is provided a spring 17 which is abutted against the limb 23 of the brake caliper 10 and is coupled to the back plate 2 by means of a grooved pin 24 with washer 25. In order to prevent it from turning about the grooved pin 24, the spring 17 is,

furthermore, supported with its stem ends 3, 4 at ribs or cams 26, 27 which are formed as an integral part of the back plate 2. The spring 17 is, moreover, furnished with an arm 31, 32 whose free end 28 is in abutment with the carrier element 6 of the brake carrier 1 and which ensures that the back plate 2 and, for that matter, also the brake caliper 10 are held down in the direction of the axis of the brake disc (the direction indicated by the arrow A). To provide a positive locking of the brake caliper 10 with the back plate 2, back plate 2 is furnished with a rib 29 which is circular ring sector-shaped and is straddled by the limb 23 of the brake caliper 10 in such a manner as to exclude a shift of the brake caliper 10 relative to the back plate 2 in a plane parallel to the brake disc.

The spot-type disc brake shown in Figure 4 differs from that in Figures 1 and 2 in so far as instead of a brake carrier 1 being boltable to the steering knuckle and constituting a separate member, there is provided a brake carrier 21 which consists of a sheet metal stamping and forms an integral part with the steering knuckle (not shown in detail in the drawing). The brake carrier 21 is formed with shoulders at both sides which are offset in a forward direction and which represent the carrier elements 9 and 30 to support and guide the brake lining 22. The brake caliper 10 is axially slidably guided at two pins being firmly screwed to the brake carrier 21 and extends at a distance beyond the lateral ends of the back plate 22. For the rest, the set-up and mode of operation of the spot-type disc brake shown in Figure 4 are identical to those of the brake shown in Figures 1 and 2.

The spring 17 shown in scaled-up size in Figures 3 and 5 to 7 is bent from one integral wire section. The two free ends of the wire section form two resilient arms b, c of substantially equal length which extend in diametrically opposite directions from the intermediate portion a. The intermediate portion a is bent together in a U-shaped configuration and forms a parallel spring d which is bent off at right angles to the two stem ends 3, 4 in the direction toward the carrier element 6 or 30. The spring stems 31, 32 of the parallel spring d are bent off upwardly in their end portion 28 so that the end portion 28 forms a sliding element with which the parallel spring d abuts with the inner face 35 of the carrier element 30, or with the bottom side of the carrier element 6 so far as the embodiment according to Figure 1 is concerned. The two stem ends 3, 4 extending vertically upward from the spring stems 31, 32 form a radial arm e with which the spring 17 is adapted to be fastened to the back plate 2 or 22. Fastening is accomplished by means of a grooved pin 24 which is beaten into a bore 38 in the back plate 2 or 22 interposing a washer 25 and which presses the stem ends 3, 4, extending in vertical direction and jointly forming the radial arm e of the spring 17 firmly against the external surface of the back plate 2 or 22. In order to positively exclude any swivelling movement of the spring 17 about the grooved pin 24, the back plate 2 or 22 is formed with ridge-shaped or rib-shaped cams 26, 27 against whose lateral surfaces facing each other the stem ends 3, 4 are abutted. The resilient arms b, c, or the spring stem 31 are partly wound around the cams 26, 27 so that the spring 17 is given a firm, untwistable support. To the end of enabling a sufficient spring action on the part of the arms b, c, these arms b, c are bent up bow-shaped, or Ω-shaped as is clearly revealed by Figures 3 and 6 so that exclusively the end lengths 36, 37 of the arms b, c abut with the limb 23 of the brake caliper 10 urging the latter in the longitudinal direction of the brake piston.

The two spring stems 31, 32 are arranged at a distance from and parallel to each other in a plane running at right angles to the plane of the brake disc in order to enable an optimum spring action on the part of the parallel spring d in the direction of the arrow E. To render such an arrangement possible, the front spring stem 32 is offset forwardly in the range of its stem end 4 by a larger amount g than the spring stem 31 which is offset forwardly by the amount h. It thus becomes possible to arrange the spring stems 31, 32 side by side over the major part of their length.

CLAIMS

1. A floating caliper spot-type disc brake, in particular for an automatic vehicle, of the kind having a brake caliper (10) axially slidably guided at a brake carrier (1 or 21) and arranged between carrier elements (5, 6 or 9, 30) of the brake carrier (1 or 21) together with a spring (17) biasing the brake caliper (10) and the brake carrier (1 or 21) radially against each other and being supported with at least one spring arm (b or c) at the front end of the brake caliper (10) facing away from the actuating device (12), characterised in that the spring (17) is provided with a stem (31, 32) extending roughly tangentially relative to the brake disc and parallel to the back plate (2) and having a free end portion (28) which is resiliently abutted against one of the two carrier elements (6 or 30) of the brake carrier (1 or 21), the spring (17) being furnished with at least one arm (e) which is solidly coupled with the back plate (2).

2. A floating caliper spot-type disc brake as claimed in claim 1, characterised in that the spring (17) is formed from one integral wire section and has an approximately τ-shaped configuration, the lower end of the radially extending arm (e) of the spring (17) which faces the axis of the brake disc being furnished with a stem (d) supported at the carrier element (6 or 30) and extending parallel to the two arms (b, c) which are coupled to the upper end of the radial arm (e) and supported at the brake caliper (10), and having such a length that it projects beyond the free end of the one resilient arm (c).

3. A floating caliper spot-type disc brake, as claimed in claim 2, characterised in that the τ-shaped spring (17) is formed from a wire section whose free ends constitute two resilient arms (b, c) approximately equal in length which extend from an intermediate portion (a) of the wire section in diametrically opposite directions parallel to the plane of the back plate (2), with the intermediate portion (a), on its part, bent together in a U-shaped configuration so forming a parallel spring (d), and the two ends (3, 4) of the stems (31, 32) of the

intermediate portion (a) which are directed parallel to each other extending for a short length (e) at right angles to the two resilient arms (b, c) in the direction of the axis of the brake disc, and that portion of the spring (17) which comprises the end of the parallel spring (d) being bent together in a U-shaped configuration extending tangentially relative to the brake disc and parallel to the back plate (2) up to the one carrier element (6 or 30) of the brake carrier (1 or 21) and being resiliently abutted against the latter with its end portion (28).

4. A floating caliper spot-type disc brake as claimed in any one of the preceding claims, characterised in that the back plate (2 or 22) is furnished with ribs or cams (26, 27) against which the stem ends (3, 4) of the spring (17) which form the radial arm (e) are abutted, the length of the cams (26, 27) being such that the resilient arms (b, c) extending in diametrically opposite directions are each applied on the pertaining cam (26 or 27) in a straddling configuration at the upper and lower end of that cam.

5. A floating caliper spot-type disc brake as claimed in any one of the preceding claims, characterised in that in the range between the two cams (26, 27) of the back plate (2 or 22) bearing the spring (17), there is provided a rivet, grooved pin (24) or similar means which presses the stem ends (3, 4) of the spring (17) to the lateral face of the back plate (2 or 22) and which is firmly anchored to the back plate (2 or 22) and furnished with a broad head portion (25) straddling the stem ends (3, 4).

6. A floating caliper spot-type disc brake as claimed in any one of the preceding claims, characterised in that the back plate (2 or 22) bearing the spring (17) has a circular ring sector-shaped rib (29 or 39) with which the back plate (2 or 22) is abutted against a correspondingly shaped recess (33) of the brake caliper (10), the recess (33) being so dimensioned as to largely straddle the rib (29 or 39) and to exclude in this manner any shift whatsoever of the back plate (2 or 22) relative to the brake caliper (10) in a radial direction, and the back plate (2 or 22) having cams (26, 27) with which it engages corresponding depressions provided in the brake caliper (10), thereby excluding any twisting of the back plate (2 or 22) relative to the brake caliper (10).

7. A floating caliper spot-type disc brake as claimed in any one of the preceding claims, characterised in that the two resilient arms (b, c) of the spring (17) abutting against the brake caliper (10) are bent out roughly Ω-shaped in a plane at right angles to the plane of the brake disc, each of the external ends (36, 37) of the arms (b, c) which are abutted against the brake caliper (10) projecting a slight amount (f) relative to the stem ends (3, 4) pressed to the back plate (2 or 22).

8. A floating caliper spot-type disc brake as claimed in any one of the preceding claims, characterised in that the two spring stems (31, 32) supported at the carrier element (6 or 30) and bent together to form a parallel spring (d) are of different lengths, the difference in length (a) corresponding to the diameter of the shank (34) of the grooved pin (24).

9. A floating caliper spot-type disc brake as claimed in any one of the preceding claims, characterised in that the free end of the parallel spring (d) formed by the two stems (31, 32) is bent into the form of a hook and constitutes a sliding element, the end portion (28) of the parallel spring (d) being abutted against the inner face (35) of the carrier element (6 or 30).

10. A floating caliper spot-type disc brake as claimed in any one of the preceding claims, characterised in that the free end of the parallel spring (d) formed by the two stems (31, 32) is bent into the form of a hook and constitutes a sliding element, the end portion (28) of the parallel spring (d) being abutted in a spot and with only one cheek against the inner face (35) of the carrier element (6 or 30).

11. A floating caliper spot-type disc brake as claimed in any one of the preceding claims, characterised in that the spring stem (31 and/or 32) is supported at and is retained by a cam or projection arranged at the back plate and/or at the brake caliper (10) to prevent an excessive spring excursion.

12. A floating caliper spot-type disc brake substantially as described with reference to the accompanying drawings.

Printed in the UK for HMSO, D8818935, 3/85, 7102.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.